The University Of Sheffield.

UNIVERSITY of York

EEPRU Policy Research Unit in Economic Evaluation of Health & Care Interventions

Policy Research Unit in Economic Evaluation of Health & Care Interventions (EEPRU)

A SCOPING REVIEW ON THE PRODUCTION OF DIFFERENT ASPECTS OF QUALITY OF HEALTH CARE

February 2017
Report 053

Authors: Walker S[1], Gutacker N[1] and Sculpher M[1]

[1] Centre for Health Economics, University of York

The Policy Research Unit in Economic Evaluation of Health and Care interventions is funded by the Department of Health Policy Research Programme. It is a collaboration between researchers from then University of Sheffield and the University of York.

The Department of Health's Policy Research Unit in Economic Evaluation of Health and Care Interventions is a 5 year programme of work that started in January 2011. The unit is led by Professor John Brazier (Director, University of Sheffield) and Professor Mark Sculpher (Deputy Director, University of York) with the aim of assisting policy makers in the Department of Health to improve the allocation of resources in health and social care.

1.0 Research Aim

In order to deliver sustainable health and care services it is helpful to understand the relationship between different aspects of "quality" and costs of health care. Furthermore, it is important to understand how aspects of “quality” of health care are affected as a result of extra financial demands on the health care budget. The aim of this scoping document is to briefly summarise relevant literature examining the production of different aspects of health care “quality”, and on how extra demands on the health care budget impact on “quality”. The document also proposes an approach for estimating the marginal impact of expenditure on different aspects of “quality” using data currently being routinely collected in the NHS.

2.0 Motivation and background

The allocation of finite resources in the health budget amongst competing services requires that choices have to be made regarding which services are prioritised. The opportunity cost of increasing the provision of one form of health care is the loss of benefits resulting from the forgone opportunity to fund other services from the same amount of resource. Typically, economic evaluation of health care in the UK has focused on a single unit of outcome, the quality-adjusted life-year (QALY) (1). Recent research has estimated that, for every £13,000 extra spent on a treatment in the NHS, one QALY is displaced as a result of reductions in other services (2). This estimate of the NHS’ marginal productivity suggests, therefore, that, for a treatment to represent value for money, it must generate QALYs at lower than £13,000 per QALY. The QALY is a generic unit of health which captures both the quantity and quality of life generated by health care interventions. However, there are other aspects of quality of care that may also be considered an aspect of benefit which are not captured in the QALY. These are discussed in more detail in the next section.

The relationship between different aspects of quality of care is not well understood. For example, does improving access to health care also improve patient satisfaction? Furthermore, the link between different aspects of quality of care and costs is also problematic. The literature has discussed the possibility of a ‘U Shaped’ cost curve for quality. This suggests that, at lower levels of quality, improvements can result in cost savings from, for example, the prevention of costly adverse events; but, at higher levels, diminishing marginal returns to factor inputs set in resulting in higher quality becoming more expensive (3–5).

This project aims to undertake a rapid literature review to consider the following in the UK:

- The production relationship between the different aspects of quality of health care
- The relationship between different aspects of quality of care and cost
- The NHS’ marginal productivity with respect to different aspects of quality.

2.1 What is quality of health care?

There are many different aspects of quality of health care provision which could be considered of value. Donabedian set out a framework for examining health services and evaluating quality of health care which focused on the structure, process and outcomes of health care (6). The Darzi Report in 2008 defined quality in terms of safety, clinical effectiveness, patient experience and person-centred care (7). A recent report on quality by Pittam and colleagues defines quality as being organised into six domains of access, capacity, effectiveness, equity, person-centred care and

experience, and safety (8). The WHO defines quality of health care in terms of: effectiveness, efficiency, accessibility, acceptability/patient-centred, equity, and safety (9).

Some general definitions of the different aspects of quality of health care are provided below:

- *Access* can be defined in terms of the timing, geographical location and setting of the health care provision
- *Effectiveness* can be defined in terms of clinical effectiveness and improved health (and, therefore, could be considered to be captured by the QALY)
- *Equity* is defined by WHO in terms of equity of provision to all regardless of their characteristics: "delivering health care which does not vary in quality because of personal characteristics such as gender, race, ethnicity, geographical location, or socioeconomic status" (p10; (9)). Pittam et al also include a notion of equitable health outcomes as well as equity in terms of access (8)
- *Patient-centred care* can be defined in terms of health care that takes into account the preferences, aspirations and culture of the patient
- *Patient experience (or patient satisfaction)* can be defined in terms of how they view the process and/or outcomes of care
- *Safety* can be defined in terms of minimising risk and harm to patients from health care

3.0 The literature

Overview

A targeted review was conducted to identify literature considering the production of different aspects of quality in health care, the relationship with costs and the marginal impact of extra expenditure on quality in the UK NHS. For this research, we focused on four aspects of quality of care: i) Access, ii) Effectiveness, iii) Patient experience/satisfaction, and iv) Safety. Below we detail the inclusion criteria, search methods and results.

Inclusion criteria

The following inclusion criteria were considered:

1. Any research examining the relationship between two or more aspects of quality of health care in the UK.
2. Any research examining the relationship between 1 or more aspects of quality of health care and cost in the UK.
3. Any research examining the marginal impact of expenditure on one or more aspects of quality of health care

Research which considered the impact of a new intervention/policy on different aspects of quality of care and cost were excluded.

Search strategy

Standard literature review search methods would have resulted in an unmanageable number of papers to consider as a result of the frequency of the terms related to quality being used in the health care literature. Therefore, an alternative approach to identifying relevant literature was used. Experts in the field were approached and asked to identify any relevant research which met any of the criteria described above.

Results

Below we briefly review the identified literature broken down by our three different inclusion criteria.

1. Research examining the relationship between two or more aspects of quality of health care in the UK.

Two aspects of quality considered

Llanwarne et al (2013) examined the relationship between clinical quality, patient experience and access for primary care in England (10). Clinical quality was measured by outcomes on the UK Quality and Outcomes framework and patient experience and access by the General Practice Survey. Although all the correlations between clinical quality and patient survey scores were positive, the strength of the association was weak. Correlations were highest with clinical quality for patient reported access scores and overall satisfaction.

Black et al (2014) examined the relationship between patient report outcome measures (PROMs) and patient reported experience measures (PREMS) (experience/satisfaction) for patients undergoing hip and knee replacements and groin repair in the West Midlands. The experience measures included: i) consistency and co-ordination of care, ii) treatment with respect and dignity, iii) adequacy of pain control, iv) sufficient explanation and involvement, v) communication with and trust in doctors and nurses, vi) cleanliness, and vii) sufficient discharge information. PROMs included disease specific PROMs and generic PROMs. The authors found a significant but weak positive association between overall PREM scores and PROM score for all three procedures.

Mendonca et al (2015) examined the relationship between access to cancer care (measured by the number of pre referral consultations with their GP) and patients subsequent experience of their cancer care using the English Cancer Patient Survey (11). They found strong evidence that patients with 3 or more pre referral consultations (indicating poor access) reported worse experience of their care.

More than two aspects of quality considered

Gutacker and Street (2015) performed a provider level comparison of hip replacement surgery looking at length of stay, emergency readmission (safety/effectiveness), waiting times (access) and patient reported outcomes (PROMs) (effectiveness) in the English NHS (12). They found correlation at the provider level with improved quality on one aspect being linked to improved quality on another. In particular, they found: i) that providers with a shorter length of stay had better postoperative health outcomes measured by PROMs, ii) hospitals with shorter length of stay had a lower proportion of patients waiting more than 18 weeks, iii) hospitals with better postoperative health outcomes had a lower proportion of patients waiting more than 18 weeks, and iv) hospitals with better postoperative health outcomes had a lower probability of emergency readmission. This was the most comprehensive study identified with regards to the breadth of aspects of quality of health care considered.

2. Research examining the relationship between 1 or more aspects of quality of health care and cost in the UK.

Siciliani et al (2009) examined the relationship between waiting times and hospital costs for elective procedures in the NHS between 1998 and 2002 (13). They found evidence of a U-shaped relationship between hospital costs and waiting times, but that at the sample mean (a waiting time of 103) waiting times had no significant effect on costs, or at most, a positive one (higher waiting times leads to higher costs). They found that the level of waiting times which minimises costs is always below 10 days.

As part of the EuroDRG project a number of cross European studies were conducted which considered the impact of adverse events, urinary tract infections and wound infections, which can be considered measures of quality for both effectiveness and safety, on costs. Gaughan et al (2012) examined the relationship between costs and adverse events for coronary artery bypass surgery across 10 European countries, including England (14). They found that adverse events and wound infections significantly increased costs for patients but that urinary tract infections were not. Geissler et al (2012) examined the relationship between adverse events and costs for hip replacement (15). They found that in England, adverse events, wound infections and urinary tract infections significantly increased costs. Hakkinen et al (2012) examined the relationship for acute myocardial infarction and again found that adverse events, urinary tract infections and wound infections significantly increased cost (16). Mason et al (2012) examined the relationship for appendectomies and found that adverse events and wound infections significantly increased costs (17). Peltola (2012) found that adverse events and urinary tract infections significantly increased ths costs of hospital stays for strokes (18). Results for cholecystectomies and child delivery were less clear (19,20).

Gutacker et al (2013) examined the relationship between risk adjusted costs and PROMs for four procedures (hip replacement, knee replacement, varicose vein and groin hernia surgery) (4). For hip replacement surgery they found a U shaped relationship between costs and outcomes. For example, at the 25th percentile, a one point increase in quality resulted in a cost reduction of £64, but at the mean value, a one point increase in quality resulted in costs increasing by £90. This suggests that some providers could improve quality and reduce costs. Results for the other procedures were less clear although there was some evidence that the relationship between costs and PROMs was negative (i.e. improving effectiveness resulted in reduced costs).

Laudicella et al (2013) examined the associated between hospital cost and process quality indicators for hip fracture, stroke and acute myocardial infarction emergency admissions in the England NHS (21). Quality of care was measured using a number of process indicators from guidelines for the best treatment of the different diseases. For strokes, they found clear evidence that higher quality was associated with higher costs. For acute myocardial infarctions the evidence was mixed with higher costs associated with some measures of quality of care (e.g. provision of primary angiography to non ST elevated myocardial infarction patients) and lower costs with others (e.g. providing primary angiography within 150 minutes). For hip fracture they found no association between quality of care and costs.

3. Research examining the marginal impact of expenditure on one or more aspects of quality of health care.

Research examining the impact at the margin of extra calls on the budget and the impact this has on different aspects of quality of care was very limited. As part of their research to estimate the cost-effectiveness threshold for the NHS with regards to quality adjusted life years, Claxton and colleagues examined the impact health care expenditure had on non-mortality based outcome indicators (2). They examined the relationship between health care expenditure and patient reported outcome measures for hip and knee replacements. They found that increases in expenditure were associated with improvements in patient reported outcome measures for hip and knee replacements.

4.0 Proposed methods to assess the production of different aspects of quality of care in the NHS

Overview

As part of this research we explored potential approaches for estimating the marginal impact of expenditure on different aspects of "quality" at the margin in the NHS. In this section we briefly outline the data currently being routinely collected in the NHS and then discuss the research methods which could be used to examine the expenditure quality relationship. For this section we focus solely on the production of quality in secondary care. We also do not consider data collected as part of clinical registers and audits led by the medical professions.

Data

The NHS collects a large amount of data on the activities and procedures it performs. These data sets are briefly described below:

Hospital episode statistics:

Hospital episode statistics (HES) collect data on secondary care activities in England (22). Since 1989, data on admitted patient care has been collected. In 2003 this was expanded to include outpatient attendances as well. Since 2007, accident and emergency data has also been collected. Each HES record contains a large amount of information about the individual patient attending hospital including clinical information about diagnoses and operations, information about the patient (e.g. age, gender and ethnicity), administrative information such as waiting times and geographical information such as where they live and where they are treated. Information about admission and discharge date can be used to calculate inpatient length of stay, which has sometimes been used as a proxy of resource utilisation. At present all secondary care in England is collected in HES.

Office for National Statistics mortality data:

The Office for National Statistics (ONS) collects data on every death in England and Wales. This data can be linked to the HES data to examine mortality both within and following stays in hospital.

Patient reported outcome measures:

Patient reported outcome measures (PROMs) assess the impact care has on NHS patients from the patient perspective (23). Only four procedures are currently covered: i) hip replacements, ii) knee replacements, iii) groin hernia surgery and iv) varicose veins. Measures of health state and health

related quality of life are collected before and after the procedures to capture the impact of the procedure on the patient's health. At present, all patients undergoing any of these four procedures in England should be asked to complete the PROM questionnaires. This data can be linked to HES data at an individual patient level.

NHS Friends and Family Test

Since 2013 the NHS Friends and Family test has been used to help service providers and commissioners understand whether their patients are happy with their service. Patients are asked how likely they are to recommend their care to friends and family if they needed similar treatment. This data has not previously been linked to HES data at an individual patient level and we are unsure whether it could potentially be in the future. However, this data is currently published at the provider level for most inpatient services.

Patient reported experience measures:

Patient reported experience measures capture what patients think of the process of the care they receive. Aspects include dignity, information provided, trust in medical staff, cleanliness and timeliness of care. Currently, data on patient experience in secondary care is collected nationally through two surveys, the Adult Inpatient Survey and the Accident and Emergency Survey (24). However, both of these surveys only collect a subsample of patients. At present, this data is not easily accessible and it is unclear if it could be linked to HES data.

NHS Reference Costs

Every financial year since 1997/8 the Department of Health has collected cost data from NHS providers (25). Each provider has to provide the average unit cost for each activity as defined by the Health Care Resource Group (26). This provides evidence at the provider level of costs for a particular procedure. Evidence is not available at the individual patient level but the costs at a provider level can be linked to individual patient level data from HES.

Summary of data

There are many different aspects of quality of health care provision which could be considered of value. These different aspects of quality can also be measured in different ways. Whilst a multitude of data is collected by the NHS, the data is not always readily available or reported at the same level (e.g. provider vs. patient level). Some data is more easily accessible and available for research purposes.

HES data has been widely used for research on the NHS. It provides evidence at the patient level on activities performed and clinical information on the patient which is important for controlling differences in severity as well as information on aspects of quality of care such as waiting times (a measure of access) and geographical information on location of procedure and the patient's residence (also a measure of access). Further it provides information on emergency readmissions of patients following procedures, which can be seen as a measure of both safety and effectiveness. HES data can also be linked to ONS mortality data, with mortality being a key measurement of effectiveness of care. For four procedures (hip replacements, knee replacements, groin hernia surgery and varicose veins), HES can also be linked to PROMs data, which provides information on the quality of life impact of the procedures, a measure of effectiveness. Whilst costs at the patient

level are not available, NHS reference costs can be used to estimate the cost of each procedure at a provider level and linked to HES individual patient level data. Data on patient experience/satisfaction is more challenging. The NHS Friends and Family Test is collected for each procedure and is potentially accessible and linkable to HES at an individual level, however, to our knowledge, no research has yet done this. However, provider level data by procedure for this test is available and could be used as a measure of patient experience/satisfaction.

Methods

The aim of the proposed research is to estimate the marginal impact of expenditure on different aspects of quality in the NHS (i.e. how at that margin changes in the budget impact on different aspects of quality). Similar research was undertaken by Claxton and colleagues to estimate the NHS cost-effectiveness threshold for quality-adjusted life years (2). In this case, the relationship between changes in expenditure causing changes in different aspects of quality would need to be estimated for the NHS.

A key challenge to identifying the causal effect of expenditure on the different aspects of quality is issues with endogeneity (where the error term in regressions is correlated with the explanatory variables) which can result in misestimation of the effect. The two main issues which could result in endogeneity in estimating the causal effect of expenditure on different aspects of quality are simultaneity (where the variables of interest are codetermined) and omitted variable bias (where a confounding variable relates to both dependent and explanatory variables and is not included in the analysis). Different statistical methods are available to control for problems arising from endogeneity (such as instrumental variable regression) and the research would need to consider which was most appropriate in this case.

Potential case study- Hip replacement surgery

As previously reported, Gutacker and Street (2015) performed a provider level comparison of hip replacement surgery looking at length of stay, emergency readmission (safety/effectiveness), waiting times (access) and patient reported outcomes (PROMs) (effectiveness) in the English NHS (12). This work could be expanded to examine the relationship using costs (as reported at the provider level) as a proxy for expenditure and the different aspects of quality.

Initially, the research would examine the relationship between costs and the different aspects of quality of health care independently. This would provide evidence on the effect of expenditure on each aspect of quality independently but would ignore the potential dependence between the different aspects of quality and so could lead to inaccurate estimates. Figure 1 presents a simple graphical depiction of this research.

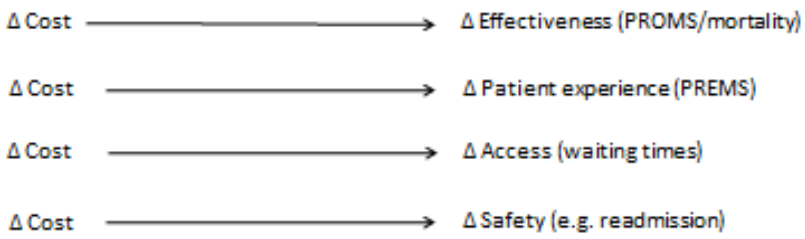

Figure 1- Estimation of independent causal relationships between expenditure and different aspects of quality

If it is possible to initially estimate the independent relationships between expenditure and different aspects of cost, it may be possible to extend this work to consider the joint relationship between expenditure and the different aspects of quality. Figure 2 presents a simple graphical depiction of this proposed research.

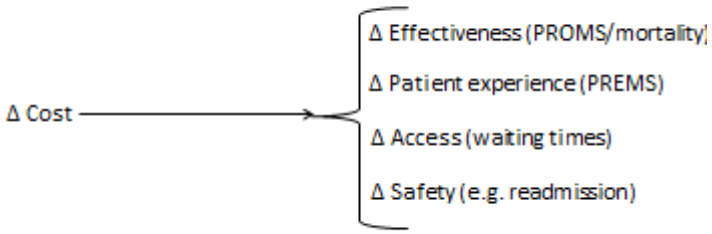

Figure 2

5.0 Discussion

This report briefly, and non-exhaustively, summarises research conducted in the UK examining the relationship between different aspects of quality of health care and costs.

Research which examined the relationship between different aspects of quality of health care in the UK generally found a positive relationship at both the patient and provider levels. Patients who received more effective care also had a better experience of the health care they received (10,27).

Similarly, providers who performed better on one aspect of quality of health care also tended to perform better on other aspects of quality of health care (12).

The relationship between the cost of health care and different aspects of quality was more complex. As noted previously, it has been suggested that there is a U shaped relationship between costs of care and quality, whereby at lower levels of quality, improvements can result in cost savings from the, for example, prevention of costly adverse events, but at higher levels diminishing marginal returns to factor inputs set in resulting in higher quality becoming more expensive. The EURO DRG papers demonstrated that avoiding adverse events, a measure of safety and effectiveness, resulted in lower costs in many cases (14–18). However, evidence from other studies was mixed with Laudicella et al (2013) providing evidence that higher quality was associated with higher cost in some cases and lower costs in others (21). There was also evidence of a U shaped cost curve with relation to waiting times and patient reported outcomes for elective hip replacement surgery (4,13). Two recent systematic reviews of USA and European studies examining the relationship between costs and quality found similarly mixed associations (5,28).

A further body of literature examining the relationship between staffing levels and quality of care has not been considered here, see for example Rafferty et al (2007) (29). This body of literature also provides some indirect evidence of a link between costs and quality, with lower patient to staff ratios potentially indicating higher costs.

All of the previously described research merely examines the association between different aspects of quality and between different aspects of quality and cost. They do not imply any form of causal relationship. The only identified piece of work looking at the causal association between expenditure and quality of care, in this case effectiveness measured by patient reported outcomes for hip and knee replacement surgery, was by Claxton and colleagues (2). They found a clear relationship that increases in expenditure resulted in improvements in patient reported outcome.

References

1. NICE. Guide to the methods of technology appraisal [Internet]. 2013. Available from: http://www.nice.org.uk/media/B52/A7/TAMethodsGuideUpdatedJune2008.pdf
2. Claxton K, Martin S, Soares M, Rice N, Spackman E, Hinde S, Devlin N, Smith PC, Sculpher M. Methods for the estimation of the National Institute for Health and Care Excellence cost-effectiveness threshold. *Heal Technol Assess* [Internet]. 2015;**19**. Available from: http://journalslibrary.nihr.ac.uk/hta/hta19140
3. Juran J, Gryna F, Jr RB. Quality control handbook, 1974. *McGraw-Hill B Company, Chapters*.
4. Gutacker N, Bojke C, Daidone S, Devlin NJ, Parkin D, Street A. Truly inefficient or providing better quality of care? Analysing the relationship between risk-adjusted hospital costs and patients' health outcomes. *Health Econ* [Internet]. 2013 [cited 2016 Aug 1];**22**:931–947. Available from: http://www.ncbi.nlm.nih.gov/pubmed/22961956
5. Søgaard R, Enemark U. The cost–quality relationship in European hospitals: a systematic review. *J Health Serv Res Policy* [Internet]. SAGE PublicationsSage UK: London, England; 2017 [cited 2017 Mar 3];**22**:126–133. Available from: http://journals.sagepub.com/doi/10.1177/1355819616682283
6. Donabedian A. The Quality of Care. *JAMA* [Internet]. American Medical Association; 1988 [cited 2017 Mar 3];**260**:1743. Available from:

http://jama.jamanetwork.com/article.aspx?doi=10.1001/jama.1988.03410120089033
7. Darzi A. High Quality Care for All: NHS Next Stage Review Final Report. 2008.
8. Pittam G, Dent M, Hussain N, Griffin M, Hovard L, Blackwood R. A multi method study to inform the development of QualityWatch: consensus on quality. 2015;
9. World Health Organisation. Quality of care: A process for making strategic choices in health systems. 2006.
10. Llanwarne NR, Abel GA, Elliott MN, Paddison CAM, Lyratzopoulos G, Campbell JL, Roland M. Relationship between clinical quality and patient experience: analysis of data from the english quality and outcomes framework and the National GP Patient Survey. *Ann Fam Med* [Internet]. [cited 2016 Aug 2];**11**:467–472. Available from: http://www.ncbi.nlm.nih.gov/pubmed/24019279
11. Mendonca SC, Abel GA, Saunders CL, Wardle J, Lyratzopoulos G. Pre-referral general practitioner consultations and subsequent experience of cancer care: evidence from the English Cancer Patient Experience Survey. *Eur J Cancer Care (Engl)* [Internet]. 2015 [cited 2016 Apr 13]; Available from: http://www.ncbi.nlm.nih.gov/pubmed/26227343
12. Gutacker N, Street A. Multidimensional performance assessment using dominance criteria [Internet]. CHE Res. Pap. 115. 2015. Available from: https://www.york.ac.uk/media/che/documents/papers/researchpapers/CHERP115_Multidimensional_performance_assessment_dominance_criteria.pdf
13. Siciliani L, Stanciole A, Jacobs R. Do waiting times reduce hospital costs? *J Health Econ*. 2009;**28**:771–780.
14. Gaughan J, Kobel C, Linhart C, Mason A, Street A, Ward P. WHY DO PATIENTS HAVING CORONARY ARTERY BYPASS GRAFTS HAVE DIFFERENT COSTS OR LENGTH OF STAY? AN ANALYSIS ACROSS 10 EUROPEAN COUNTRIES. *Health Econ* [Internet]. John Wiley & Sons, Ltd; 2012 [cited 2016 Aug 2];**21**:77–88. Available from: http://doi.wiley.com/10.1002/hec.2842
15. Geissler A, Scheller-Kreinsen D, Quentin W. DO DIAGNOSIS-RELATED GROUPS APPROPRIATELY EXPLAIN VARIATIONS IN COSTS AND LENGTH OF STAY OF HIP REPLACEMENT? A COMPARATIVE ASSESSMENT OF DRG SYSTEMS ACROSS 10 EUROPEAN COUNTRIES. *Health Econ* [Internet]. John Wiley & Sons, Ltd; 2012 [cited 2016 Aug 2];**21**:103–115. Available from: http://doi.wiley.com/10.1002/hec.2848
16. Häkkinen U, Chiarello P, Cots F, Peltola M, Rättö H. PATIENT CLASSIFICATION AND HOSPITAL COSTS OF CARE FOR ACUTE MYOCARDIAL INFARCTION IN NINE EUROPEAN COUNTRIES. *Health Econ* [Internet]. John Wiley & Sons, Ltd; 2012 [cited 2016 Aug 2];**21**:19–29. Available from: http://doi.wiley.com/10.1002/hec.2840
17. Mason A, Or Z, Renaud T, Street A, Thuilliez J, Ward P. HOW WELL DO DIAGNOSIS-RELATED GROUPS FOR APPENDECTOMY EXPLAIN VARIATIONS IN RESOURCE USE? AN ANALYSIS OF PATIENT-LEVEL DATA FROM 10 EUROPEAN COUNTRIES. *Health Econ* [Internet]. John Wiley & Sons, Ltd; 2012 [cited 2016 Aug 2];**21**:30–40. Available from: http://doi.wiley.com/10.1002/hec.2836
18. Peltola M. PATIENT CLASSIFICATION AND HOSPITAL COSTS OF CARE FOR STROKE IN 10 EUROPEAN COUNTRIES. *Health Econ* [Internet]. John Wiley & Sons, Ltd; 2012 [cited 2016 Aug 2];**21**:129–140. Available from: http://doi.wiley.com/10.1002/hec.2841
19. Or Z, Renaud T, Thuilliez J, Lebreton C. DIAGNOSIS RELATED GROUPS AND VARIATIONS IN RESOURCE USE FOR CHILD DELIVERY ACROSS 10 EUROPEAN COUNTRIES. *Health Econ* [Internet]. John Wiley & Sons, Ltd; 2012 [cited 2016 Aug 2];**21**:55–65. Available from: http://doi.wiley.com/10.1002/hec.2835
20. Paat-Ahi G, Świderek M, Sakowski P, Saluse J, Aaviksoo A. DRGs IN EUROPE: A CROSS COUNTRY ANALYSIS FOR CHOLECYSTECTOMY. *Health Econ* [Internet]. John Wiley & Sons, Ltd; 2012 [cited 2016 Aug 2];**21**:66–76. Available from: http://doi.wiley.com/10.1002/hec.2833
21. Laudicella M, Li Donni P, Smith PC. Hospital quality and costs: evidence from England. 2013;
22. NHS Digital 1 Trevelyan Square, Boar Lane, Leeds, LS1 6AE, United Kingdom. Hospital Episode

Statistics. NHS Digital, 1 Trevelyan Square, Boar Lane, Leeds, LS1 6AE, United Kingdom;
23. Statistics » Patient Reported Outcome Measures (PROMs) [Internet]. Available from: https://www.england.nhs.uk/statistics/statistical-work-areas/proms/
24. NHS Surveys :: Focused on patients' experience :: Home [Internet]. Available from: http://www.nhssurveys.org/
25. NHS. NHS reference costs - GOV.UK [Internet]. [cited 2016 Mar 30]. Available from: https://www.gov.uk/government/collections/nhs-reference-costs
26. NHS Digital. Introduction to Healthcare Resource Groups. 1350;
27. Black N, Varaganum M, Hutchings A. Relationship between patient reported experience (PREMs) and patient reported outcomes (PROMs) in elective surgery. *BMJ Qual Saf* [Internet]. 2014 [cited 2016 Feb 22];**23**:534–542. Available from: http://qualitysafety.bmj.com/content/early/2014/02/07/bmjqs-2013-002707.short
28. Hussey PS, Wertheimer S, Mehrotra A. The association between health care quality and cost: a systematic review. *Ann Intern Med* [Internet]. American College of Physicians; 2013 [cited 2016 Mar 24];**158**:27–34. Available from: http://annals.org/article.aspx?articleid=1487781
29. Rafferty AM, Clarke SP, Coles J, Ball J, James P, McKee M, Aiken LH. Outcomes of variation in hospital nurse staffing in English hospitals: Cross-sectional analysis of survey data and discharge records. *Int J Nurs Stud* [Internet]. 2007 [cited 2017 Mar 26];**44**:175–182. Available from: http://linkinghub.elsevier.com/retrieve/pii/S0020748906002446